

Release notes for ENDF/B Development n-098_Cf_248
evaluation



April 26, 2017

- fudge-4.0 Warnings:

1. Cross section does not match sum of linked reaction cross sections
crossSectionSum label 0: total (Error # 0): CS Sum.

WARNING: Cross section does not match sum of linked reaction cross sections! Max diff: 0.89%

2. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 1 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [nubar]): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

3. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 2 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [nubar]): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (8.759549e-09) is too small

4. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 3 (total): / Form 'eval': / Component 0 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

5. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 3 (total): / Form 'eval': / Component 1 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

6. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 4 (n + Cf248): / Form 'eval': / Component 0 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

7. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 4 (n + Cf248): / Form 'eval': / Component 1 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

8. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission]): / Form 'eval': / Component 0 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

9. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed']) + gamma [total fission]): / Form 'eval': / Component 1 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

10. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 9 (n + (Cf248_e1 -> Cf248 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (5.897940e-10) is too small

11. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 11 (n + (Cf248_e3 -> Cf248 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (5.960336e-11) is too small

12. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 12 (n + (Cf248_e4 -> Cf248 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (1.472082e-09) is too small

13. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 13 (n + (Cf248_e5 -> Cf248 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (2.458225e-10) is too small

14. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 14 (n + (Cf248_e6 -> Cf248 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (4.855859e-09) is too small

15. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 15 (n + (Cf248_e7 -> Cf248 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (3.181179e-09) is too small

16. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 16 (n + (Cf248_e8 -> Cf248 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (2.809902e-10) is too small

17. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 17 (n + (Cf248_c -> Cf248 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

18. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 18 (Cf249 + gamma): / Form 'eval': / Component 0 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

19. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 18 (Cf249 + gamma): / Form 'eval': / Component 1 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

20. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 19 (n + Cf248 [angular distribution]): / Form 'eval': (Error # 1): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

21. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 20 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

22. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 21 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

23. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 22 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

24. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 23 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

- fudge-4.0 Errors:

1. Duplicate Eout in outgoing distribution
Reading ENDF file: ..\n-098_Cf_248.endf (Error # 0): Bad Eout

```
WARNING: skipping duplicate e_out = 5585470.0, i1 = 106 6 10.0
WARNING: skipping duplicate e_out = 5585480.0, i1 = 106 7 20.0
WARNING: skipping duplicate e_out = 5585490.0, i1 = 106 8 30.0
WARNING: skipping duplicate e_out = 5585510.0, i1 = 106 9 50.0
... plus 3 more instances of this message
```

2. Energy range of data set does not match cross section range
reaction label 9: n + (Cf248_c -> Cf248 + gamma) / Product: Cf248_c / Decay product: gamma_a / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (170000.0 -> 20000000.0) vs (110896.0 -> 20000000.0)
```

3. Energy range of data set does not match cross section range
reaction label 9: n + (Cf248_c -> Cf248 + gamma) / Product: Cf248_c / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (170000.0 -> 20000000.0) vs (110896.0 -> 20000000.0)
WARNING: Domain doesn't match the cross section domain: (250000.0 -> 20000000.0) vs (110896.0 -> 20000000.0)
WARNING: Domain doesn't match the cross section domain: (400000.0 -> 20000000.0) vs (110896.0 -> 20000000.0)
WARNING: Domain doesn't match the cross section domain: (700000.0 -> 20000000.0) vs (110896.0 -> 20000000.0)
... plus 4 more instances of this message
```

4. Energy range of data set does not match cross section range
reaction label 9: n + (Cf248_c -> Cf248 + gamma) / Product: Cf248_c / Decay product: gamma_b / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (250000.0 -> 20000000.0) vs (110896.0 -> 20000000.0)
```

5. Energy range of data set does not match cross section range
reaction label 9: n + (Cf248_c -> Cf248 + gamma) / Product: Cf248_c / Decay product: gamma_c / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (400000.0 -> 20000000.0) vs (110896.0 -> 20000000.0)
```

6. Energy range of data set does not match cross section range
reaction label 9: n + (Cf248_c -> Cf248 + gamma) / Product: Cf248_c / Decay product: gamma_d / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (700000.0 -> 20000000.0) vs (110896.0 -> 20000000.0)
```

7. Energy range of data set does not match cross section range
reaction label 9: n + (Cf248_c -> Cf248 + gamma) / Product: Cf248_c / Decay product: gamma_e / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (737988.0 -> 20000000.0) vs (110896.0 -> 20000000.0)
```

8. Energy range of data set does not match cross section range
reaction label 9: n + (Cf248_c -> Cf248 + gamma) / Product: Cf248_c / Decay product: gamma_f / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (800000.0 -> 20000000.0) vs (110896.0 -> 20000000.0)

9. Energy range of data set does not match cross section range
reaction label 9: n + (Cf248_c -> Cf248 + gamma) / Product: Cf248_c / Decay product: gamma_g / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (900000.0 -> 20000000.0) vs (110896.0 -> 20000000.0)

10. Energy range of data set does not match cross section range
reaction label 9: n + (Cf248_c -> Cf248 + gamma) / Product: Cf248_c / Decay product: gamma_h / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (1000000.0 -> 20000000.0) vs (110896.0 -> 20000000.0)

11. Calculated and tabulated Q values disagree.
reaction label 10: n[multiplicity:'2'] + Cf247 + gamma (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: -7086306.244415283 eV vs -6968180. eV!

12. Energy range of data set does not match cross section range
reaction label 10: n[multiplicity:'2'] + Cf247 + gamma / Product: gamma_a / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (7500000.0 -> 20000000.0) vs (6996510.0 -> 20000000.0)

13. Energy range of data set does not match cross section range
reaction label 10: n[multiplicity:'2'] + Cf247 + gamma / Product: gamma_a / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (7500000.0 -> 20000000.0) vs (6996510.0 -> 20000000.0)

14. Energy range of data set does not match cross section range
reaction label 10: n[multiplicity:'2'] + Cf247 + gamma / Product: gamma_b / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (7500000.0 -> 20000000.0) vs (6996510.0 -> 20000000.0)

15. Energy range of data set does not match cross section range
reaction label 10: n[multiplicity:'2'] + Cf247 + gamma / Product: gamma_b / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (7500000.0 -> 20000000.0) vs (6996510.0 -> 20000000.0)

16. Energy range of data set does not match cross section range
reaction label 10: n[multiplicity:'2'] + Cf247 + gamma / Product: gamma_c / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (7500000.0 -> 20000000.0) vs (6996510.0 -> 20000000.0)

17. Energy range of data set does not match cross section range
reaction label 10: n[multiplicity:'2'] + Cf247 + gamma / Product: gamma_c / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (7500000.0 -> 20000000.0) vs (6996510.0 -> 20000000.0)

18. Calculated and tabulated Q values disagree.
reaction label 11: n[multiplicity:'3'] + Cf246 + gamma (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: -13112733.4223938 eV vs -1.29946e7 eV!

19. Energy range of data set does not match cross section range
reaction label 11: n[multiplicity:'3'] + Cf246 + gamma / Product: gamma_a / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (13500000.0 -> 20000000.0) vs (13047400.0 -> 20000000.0)

20. Energy range of data set does not match cross section range
reaction label 11: n[multiplicity:'3'] + Cf246 + gamma / Product: gamma_a / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (13500000.0 -> 20000000.0) vs (13047400.0 -> 20000000.0)

21. Energy range of data set does not match cross section range
reaction label 11: n[multiplicity:'3'] + Cf246 + gamma / Product: gamma_b / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (13500000.0 -> 20000000.0) vs (13047400.0 -> 20000000.0)

22. Energy range of data set does not match cross section range
reaction label 11: n[multiplicity:'3'] + Cf246 + gamma / Product: gamma_b / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (13500000.0 -> 20000000.0) vs (13047400.0 -> 20000000.0)

23. Energy range of data set does not match cross section range
reaction label 11: n[multiplicity:'3'] + Cf246 + gamma / Product: gamma_c / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (14000000.0 -> 20000000.0) vs (13047400.0 -> 20000000.0)

24. Energy range of data set does not match cross section range
reaction label 11: n[multiplicity:'3'] + Cf246 + gamma / Product: gamma_c / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (14000000.0 -> 20000000.0) vs (13047400.0 -> 20000000.0)

25. Energy range of data set does not match cross section range
reaction label 11: n[multiplicity:'3'] + Cf246 + gamma / Product: gamma_d / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (14000000.0 -> 20000000.0) vs (13047400.0 -> 20000000.0)

26. Energy range of data set does not match cross section range
reaction label 11: n[multiplicity:'3'] + Cf246 + gamma / Product: gamma_d / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (14000000.0 -> 20000000.0) vs (13047400.0 -> 20000000.0)

27. Calculated and tabulated Q values disagree.
reaction label 13: Cf249 + gamma (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: 5467330.48916626 eV vs 5585460. eV!

28. Multiplicity does not match sum of linked product multiplicities!
multiplicitySum label 12: n[multiplicity:'2'] + Cf247 + gamma total gamma multiplicity
(Error # 0): summedMultiplicityMismatch

WARNING: Multiplicity does not match sum of linked product multiplicities! Max diff: 8.61%

29. Multiplicity does not match sum of linked product multiplicities!
multiplicitySum label 13: n[multiplicity:'3'] + Cf246 + gamma total gamma multiplicity
(Error # 0): summedMultiplicityMismatch

WARNING: Multiplicity does not match sum of linked product multiplicities! Max diff: 100.00%

30. Calculated and tabulated Q values disagree.
fissionComponent label 0: /reactionSuite/fissionComponents/fissionComponent[@label='0']
(Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: 232017210654.5878 eV vs 2.189784e8 eV!

31. Calculated and tabulated Q values disagree.
fissionComponent label 1: /reactionSuite/fissionComponents/fissionComponent[@label='1']
(Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: 232017210654.5878 eV vs 2.189784e8 eV!

32. Calculated and tabulated Q values disagree.
fissionComponent label 2: /reactionSuite/fissionComponents/fissionComponent[@label='2']
(Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: 232017210654.5878 eV vs 2.189784e8 eV!

33. Calculated and tabulated Q values disagree.
fissionComponent label 3: /reactionSuite/fissionComponents/fissionComponent[@label='3']
(Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: 232017210654.5878 eV vs 2.189784e8 eV!

34. A covariance matrix was not positive semi-definite, so it has negative eigenvalues.
Section 19 (n + Cf248 [angular distribution]): / Form 'eval': / LegendreLValue L=1 vs 1
(Error # 0): Bad evs

WARNING: 10 negative eigenvalues! Worst case = -2.566876e-04

- **njoy2012** Warnings:

- Evaluation has no resonance parameters given
unresr...calculation of unresolved resonance cross sections (0): No RR

```
---message from unresr---mat 9849 has no resonance parameters
copy as is to nout
```

- In some evaluations, the partial fission reactions MT=19, 20, 21, and 38 are given in File 3, but no corresponding distributions are given. In these cases, it is assumed that MT=18 should be used for the fission neutron distributions.
heatr...prompt kerma (0): HEATR/hinit (3)

```
---message from hinit---mt19 has no spectrum  
mt18 spectrum will be used.
```

3. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (1): HEATR/hinit (4)

```
---message from hinit---mf6, mt 16 does not give recoil za= 98247  
one-particle recoil approx. used.
```

4. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (2): HEATR/hinit (4)

```
---message from hinit---mf6, mt 17 does not give recoil za= 98246  
one-particle recoil approx. used.
```

5. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (3): HEATR/hinit (4)

```
---message from hinit---mf6, mt 51 does not give recoil za= 98248  
one-particle recoil approx. used.
```

6. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (4): HEATR/hinit (4)

```
---message from hinit---mf6, mt 52 does not give recoil za= 98248  
one-particle recoil approx. used.
```

7. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (5): HEATR/hinit (4)

```
---message from hinit---mf6, mt 53 does not give recoil za= 98248  
one-particle recoil approx. used.
```

8. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (6): HEATR/hinit (4)

```
---message from hinit---mf6, mt 54 does not give recoil za= 98248  
one-particle recoil approx. used.
```

9. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (7): HEATR/hinit (4)

```
---message from hinit---mf6, mt 55 does not give recoil za= 98248  
one-particle recoil approx. used.
```

10. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (8): HEATR/hinit (4)

```
---message from hinit---mf6, mt 56 does not give recoil za= 98248  
one-particle recoil approx. used.
```

11. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (9): HEATR/hinit (4)

```
---message from hinit---mf6, mt 57 does not give recoil za= 98248  
one-particle recoil approx. used.
```

12. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (10): HEATR/hinit (4)

```
---message from hinit---mf6, mt 58 does not give recoil za= 98248
one-particle recoil approx. used.
```

13. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (11): HEATR/hinit (4)

```
---message from hinit---mf6, mt 91 does not give recoil za= 98248
one-particle recoil approx. used.
```

14. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (12): HEATR/hinit (4)

```
---message from hinit---mf6, mt102 does not give recoil za= 98249
photon momentum recoil used.
```

15. There is a problem with the fission energy release.
heatr...prompt kerma (27): HEATR/nheat (3)

```
---message from nheat---changed q from 2.189784E+08 to 2.065714E+08
for mt 18
```

16. Evaluation has no resonance parameters given
purr...probabalistic unresolved calculation (0): No RR

```
---message from purr---mat 9849 has no resonance parameters
copy as is to nout
```

- **xsectplotter Errors:**

1. Duplicate Eout in outgoing distribution
(Error # 2): Bad Eout

```
WARNING: skipping duplicate e_out = 5585470.0, i1 = 106 6 10.0
WARNING: skipping duplicate e_out = 5585480.0, i1 = 106 7 20.0
WARNING: skipping duplicate e_out = 5585490.0, i1 = 106 8 30.0
WARNING: skipping duplicate e_out = 5585510.0, i1 = 106 9 50.0
... plus 3 more instances of this message
```